

bers of a pair may separate at this stage. Tetrads sometimes occur at this time. The mantle fibers (*Zugfasern*) are believed to persist from one cell generation to another. The nuclear membrane is a tonoplast, and the nuclear cavity a complex of vacuoles.

Many of the figures look rather diagrammatic, but they are carefully drawn, and the summary indicates that the author, at least, feels certain of his principal conclusions. The work is so extensive and so well presented that it cannot be laid aside; cytologists should either confirm the conclusions or correct them.—CHARLES J. CHAMBERLAIN.

**Fungi in rhizoids of liverworts.**—Investigation of about thirty species of liverworts by GARJEANE<sup>7</sup> shows that there is no uniformity in the occurrence of fungi in the rhizoids. In some forms the presence of fungi seems to be the rule; in others, especially the bark-inhabiting forms, their presence seems to be the exception. In the same colony individuals with infected rhizoids often occur together with others not infected. The details of the mode of growth of the hyphae are described for *Lophozia inflata* and species of *Cephalozia* and *Cephaloziella*. From the details it appears that the plants in no way profit as a result of the presence of fungi in their rhizoids. On the contrary, the protoplasm in the young rhizoids, and also in the neighboring cells when these are infected, is killed by the fungi. Extended infection of rhizoids is accompanied by sickening of the plants. An interesting reaction of the rhizoids to the attack of the fungus is described in *Lophozia*. When the hypha comes into contact with a rhizoid, a thickening appears on the inside of the rhizoid wall opposite the point of contact. As the hypha grows into the cell, cellulose is continually deposited ahead of the growing point, so that the hypha is surrounded by a sheath of cellulose. Often hyphae pass straight through rhizoids in this way, and become incased in a tube of cellulose. The author was successful in isolating the same species of fungus, described as *Mucor rhizophilus*, from nine species of liverworts. A large number of successful infections was made with this fungus in sterile cultures of *Lophozia inflata*, *Cephalozia bicuspidata*, *Cephaloziella* sp., and *Jungermannia ventricosa*. The author believes that the association of fungus and rhizoid is not of the nature of a mycorrhiza; neither does the fungus cause considerable damage to the plant, although strongly infected plants show the unfavorable influence of the fungus.—H. HASSELBRING.

**Fall of petals.**—FITTING<sup>8</sup> finds that a number of stimuli will cause the premature falling of the corollas of various sympetalous and polypetalous flowers. He worked in the main, however, with *Geranium pyrenaicum*. Among chemi-

<sup>7</sup> GARJEANE, A. J. M., Die Verpilzung der Lebermoosrhizoiden. *Flora* 102: 148-185. pls. 11, 12. figs. 9. 1911.

<sup>8</sup> FITTING, HANS, Untersuchungen über die vorzeitige Entblätterung von Blüten. *Jahrb. Wiss. Bot.* 49: 187-263. 1911.